FUEL ADDITIVE COMPRISING AN ALKYL HALIDE

FIELD OF THE INVENTION

The present invention relates generally to fuel additives and method therefor.

BACKGROUND OF THE INVENTION

Methods and systems for marking liquid hydrocarbons or fuels are known in the art. The fuel is generally marked by a substance that can be detected, thereby identifying the source of the fuel. For example, a simple dyeing substance may be mixed with the fuel, thereby changing the color of the fuel and allowing the fuel to be identified according to the marked color. Alternatively, the marking substance can emit light at an invisible wavelength, wherein the fuel is identified by measuring the emitted wavelength by an optical detector. According to other methods, the fuel is marked with an organic compound whose presence is later detected by a spectrometer.

One example of fuel marking systems is described in PCT published patent application WO 02/098199 (PCT application PCT/IL02/00431).

SUMMARY OF THE INVENTION

The present invention seeks to provide a novel fuel additive, as is described more in detail hereinbelow.

The inventors have surprisingly found a new property for a substance that had been previously used simply to mark fuels, as in PCT published patent application WO 02/098199. For example, tetrabromoethane (TBE) has been added to petroleum-based fuels, such as gasoline or diesel fuel, for the purposes of marking the fuel as an anti-theft procedure. The inventors have now found that TBE (and other substances) may be used as a fuel additive to improve combustion characteristics, as is described more in detail hereinbelow.

DETAILED DESCRIPTION OF EMBODIMENTS

The fuel additive of the present invention may be added in small amounts to fuel, such as but not limited to, 1-10 ppm. This small amount does not affect the color or operative properties of the fuel.

Throughout the specification and claims, the term "fuel" refers to any liquid hydrocarbon, including but not limited to, petroleum products either refined or unrefined, such as crude oil, naphtha, gasoline, diesel fuel, jet fuel, kerosene, propane, lubricant (e. g., engine oil), hydraulic fluid, natural gas (either in gaseous or liquefied form), and the like.

The fuel additive of the present invention is stable, miscible in and compatible with the fuel. For example, the fuel additive may comprise a halogenic compound, such as an alkyl halide having the general formula $C_nH_{2n+2-m}X_m$, where n=1,2,3..., m=1,2,3....X is a halogen such as fluorine (F), chlorine (Cl), bromine (Br), and iodine (I). An example of such an alkyl halide is tetrabromoethane (TBE) ($C_2H_2Br_4$).

Other examples of alkyl halides, which may be used to carry out the invention include but are not limited to: 1,1,2,2 tetrachloroethane ($C_2H_2Cl_4$), 1,1,2 trichloroethane ($C_2H_3Cl_3$), pentachloroethane (C_2HCl_5), hexachloroethane (C_2Cl_6), 1,2,4 trichloro cyclohexane ($C_6H_9Cl_3$), 1,2,4,5 tetrachloro cyclohexane ($C_6H_8Cl_4$), ethyliodide (C_2H_5I), ethylbromide (C_2H_5Br), dichloro 1,2 dibromoethane ($C_2H_2Cl_2Br_2$), dichlorotribromoethane ($C_2HCl_2Br_3$), difluoro 1 chloroethane ($C_2H_3F_2Cl$), difluoro 1,2 dibromoethane ($C_2H_2F_2Br_2$), trifluor 1,2,2 dibromoethane ($C_2HF_3Br_2$), tribromopropane ($C_3H_5Br_3$), dibromocyclohexane ($C_6H_{10}Br_2$), dibromoethane ($C_2H_4Br_4$), n-propylbromide (C_3H_7Br), 1-bromo, 4-fluoro cyclohexane ($C_6H_{10}FBr$), butylbromide (C_4H_9Br) and octylbromide ($C_8H_{17}Br$).

The fuel additive of the present invention is preferably immiscible in water. One of the advantages of this property is that sometimes there is a water phase in fuels or in storage tanks, and the insolubility of the fuel additive in water means that the fuel additive remains in solution with the fuel and is not lost to the water phase.

The fuel additive of the present invention may create a large amount of free radicals. Free radicals lead to a smoother and more uniform temperature gradient and more complete combustion in the combustion chamber. In this manner, the fuel additive improves fuel consumption.

In addition, the fuel additive of the present invention may trap heavy metal ions present in petroleum-based fuels. The trapped heavy metal ions then exit with the exhaust, instead of accumulating on the inner walls and surfaces of the combustion chamber. Thus the fuel additive has the synergistic effect of not only improving fuel consumption but also causing the combustion chamber to be cleaner, which in turn further improves fuel consumption.

It is noted that the present invention is not bound or limited in any way to the above postulations of free radicals and trapping heavy metal ions. They are presented merely as a

possible way of understanding how the fuel additive of the present invention improves performance of an internal combustion engine.

It will be appreciated by persons skilled in the art that the present invention is not limited by what has been particularly shown and described hereinabove. Rather the scope of the present invention includes both combinations and subcombinations of the features described hereinabove as well as modifications and variations thereof which would occur to a person of skill in the art upon reading the foregoing description and which are not in the prior art.